REMARKS

This Response is submitted in response to the Office Action mailed August 8, 2006, wherein the Examiner rejected Claims 1-26, all the claims in the application. Reconsideration of the application in view of the following remarks and the Declaration presented herewith is respectfully requested. It is submitted that in condition for immediate allowance .

Initially, Applicants would like to thank the Examiner for the careful consideration given this case. Claims 1-26 remain pending.

Prior to discussing the rejections, Applicants take this opportunity to set forth the following brief remarks about their new aluminum-copper-magnesium alloys having incidental addition of lithium. Their unique alloy unexpectedly provides an aluminum alloy that has increased fracture toughness and strength, superior fatigue crack growth resistance and relatively low density compared to known prior art lithium containing alloys. It is this combination of lower copper levels, higher magnesium level and lower levels of lithium than heretofore utilized in the art that provide the surprising results. Applicants submit that obtaining improved fatigue performance and improved fracture toughness at low levels of lithium additions is counter-character intuitive to the current thinking and teaching in the art. These teachings generally result in higher strength but lower fracture toughness. In marked contrast, the Applicants of the present application have discovered that both strength and toughness can be increased by small additions of lithium up to not greater than about 0.8 weight %. The precise reason for this are not obvious. In addition, improvements in fatigue with small lithium additions that do not lead to the formation of the delta prime (δ') phase are not expected. This is also contrary to current thinking that teaches that the delta prime phase in aluminum-lithium based alloys is responsible for the improvements in fatigue performance.

In support of this position discussed in the Amendment filed on May 23, 2006, Applicants respectfully submit the accompanying Declaration of Roberto J. Rioja under 37 C.F.R. 1.132. The Declaration compares the data presented in Pickens, U.S. Patent No. 5,455,003, the principal reference relied on by the Examiner, with Applicants' test data. This comparison establishes that the alloys pursuant to Pickens' teachings conform to the generally accepted view that there is an inverse relationship of yield strength to toughness. The following graph shows that when Pickens' data from Table 3 are plotted there is an unequivocal trend shown by all the data points. In marked contrast to Pickens, Applicants data for alloys with less than 0.8 percent lithium exhibit an increasing yield strength to toughness ratio. It is respectfully submitted that this is a surprising result. The Examiner's comment that data points to the right of the line in the graph at page 7 of the prior response is misplaced. All the Pickens' data fall within a distinct band as shown in the Declaration and as expected by the generally accepted knowledge in the art. This is not the case for Applicants' claimed alloys deemed to be patentable.

The Rejection Based On Pickens Under 35 U.S.C. § 103 (a)

The Examiner rejected Claims 1-15 and 18-25 under 35 U.S.C. § 103 (a) as being obvious over U.S. Patent No. 5,455,003 to Pickens et al. ("Pickens"). Applicants traverse the rejections for the following reasons.

In order to establish obviousness of a claimed invention, all elements of the claims must be disclosed, taught or suggested by the prior art. In this case, Pickens does not teach the claimed aluminum alloy and aluminum-copper-magnesium aircraft product as defined in independent Claims 1 and 25, respectively.

Pickens does not teach or suggest that the amount of Cu and Mg are below a solubility limit of the aluminum alloy. In addition, Pickens does not specify the fatigue crack growth resistance. Accordingly, Pickens does not disclose or suggest the alloy and aircraft product as claimed.

In marked contrast to Applicants' claims, Pickens instead discloses a method of making an improved aluminum-copper-lithium alloys that exhibit improved strength and fracture toughness at cryogenic temperature. Here, Pickens teaches adding higher levels of lithium to the aluminum alloy is desirable. In fact, Applicants have found that decreasing the amount of lithium and increasing the amount of magnesium within the alloy exhibits the desirable properties so that both the strength and toughness can be increased. This is illustrated in Figure 5 of the present application. The test data of Pickens when compared to Applicants test data shows that unexpected benefits that are attained with the alloys of the present invention. Applicants alloys evidence an unexpected increase in toughness with increasing yield strength. This effect may be due to maintaining the amounts of copper and magnesium within the alloy below the solubility limit of the alloy in conjunction with maintaining the amount of lithium between 0.01 to 0.8 weight percent.

It is known in the art that generally aluminum-copper-lithium-magnesium alloys exhibit an inverse yield strength to toughness ratio. See Attachment B from Rioja's Declaration. Pickens' alloys exhibit an inverse relationship between yield strength and toughness. See Attachment D from Rioja's Declaration. This graph depicts Pickens' alloys yield strength versus toughness values from the data points of Table 3 of Pickens. In other words, as the yield strength of Pickens' alloys increases, the toughness of the alloys decreases.

Although some of the alloy compositions in Pickens contained from 0.29 to 0.8 weight percent of lithium, the amount of Mg in those alloy compositions was less than the amount required by the present invention. Applicants disclose in Paragraph [0033] that "[c]are should be taken, however, to not add too much magnesium since magnesium additions beyond maximum solubility will lead to low fracture toughness and low damage tolerance." Accordingly, Pickens did not test the claimed alloys of the present invention to discover the unexpected properties of the alloys of the present invention.

Moreover, Pickens teaches away from decreasing the amount of lithium and increasing the amount of magnesium within the alloy. For example, Pickens discloses that the "preferred alloy for cryogenic use comprised 4.0% Cu and 1.0% Li" and that "lowering of the copper and lithium levels significantly below these amounts may still result in the desirable [cryogenic] trend, but with lower strengths." See Columns 17-18, lines 41-42 and lines 28-31, respectively. Pickens further teaches that "the amount of magnesium used in the present alloys has only a minor effect on the cryogenic fracture toughness trend."

Applicants respectfully submit that Pickens does not teach or suggest the aluminum alloy of the present invention where maintaining magnesium levels above 0.6 wt % and lithium levels at or below 0.8 wt % within the alloy in conjunction with maintaining the total amount of copper and magnesium below the solubility limit of the alloy provides improved and unexpected results not evidenced by Pickens' alloys. Pickens does not teach or suggest that the amount of Cu and Mg are below a solubility limit of the aluminum alloy and specify the fatigue crack growth resistance of the aluminum-copper-magnesium aircraft product. In addition, Pickens actually teaches away from the present invention. Thus, Applicants are entitled to claim the aluminum alloy and aluminum-copper-magnesium aircraft product as set forth in independent Claims 1 and 25. Applicants respectfully submit that the claimed multi-layered aluminum metal product is not obvious over the teaching of Pickens. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 103 (a) be reconsidered and withdrawn.

The Rejection Based On Pickens In View Of Rioja Under 35 U.S.C. § 103 (a)

The Examiner rejected Claims 17, 18 and 26 under 35 U.S.C. § 103 (a) as being obvious over U.S. Patent No. 5,455,003 to Pickens et al. ("Pickens") in view of U.S. Patent No. 5,137,686 to Rioja et al. ("Rioja"). Applicants respectfully traverse this rejection for the following reasons.

In order to establish obviousness of a claimed invention, all elements of the claims must be disclosed, taught or suggested by the prior art. In this case, neither Pickens nor Rioja teach or suggest the aluminum alloy having good damage tolerance and fatigue crack growth resistance where the Cu and Mg are present in a controlled amount in the alloy such that they are present in a total amount below the solubility limit of the alloy or the alloy product for use in aerospace tolerant aircraft parts having improved fatigue crack growth resistance. Applicant agree with the Examiner that Pickens does not disclose 0.1 to 2 weight % Si or 0.3 to 1 weight % Si is present in the alloy or forming the alloy into the presently claimed specific aerospace components.

As stated above, Pickens teaches adding higher levels of lithium to the aluminum alloy then claimed is desirable. As demonstrated the Pickens' alloys exhibits an inverse relationship between yield strength to toughness ratio. Further, Pickens teaches away from decreasing the amount of lithium and increasing the amount of magnesium within the alloy as expressly set forth in the claims. Thus, Pickens teaches away from Applicants' the aluminum alloy and alloy product.

Rioja discloses an aluminum lithium alloy. However, Rioja does not teach or suggest that the amount of Cu and Mg are below a solubility limit of the aluminum alloy.

In view of the forgoing, Applicants respectfully submit that the alloys of the present invention comprise unexpected properties that are advantageous over those of Pickens and that Pickens teaches away from the alloys of the present invention. Also, one skilled in the art would not find any teaching or suggestion in Pickens or Rioja alone or in combination to disclose, teach or suggest the claimed alloy or any reason for making it. This is because there is no motivation taught in any of the references to combine the references in such a way to provide the alloy for aerospace applications as claimed. Accordingly, it is respectfully requested that the rejection under 35 U.S.C. § 103 (a) be withdrawn.

It is respectfully submitted that in view of the remarks set forth above and the Amendment filed on May 23, 2006, the application is in condition for immediate allowance. Accordingly, the Examiner is respectfully requested to review that application at an early date with a view towards issuing a favorable action thereon. If upon review of the application the Examiner is unable to issue an immediate Notice of Allowance, the Examiner is requested to telephone the undersigned attorney with a view towards resolving any outstanding issues.

Early and favorable action is earnestly solicited.

Respectfully submitted,

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